

openings 54 in a bottom 56 of a fuse receptacle 316 that forms approximately one half of fuse receptacle 306 (shown in Figure 10) for receiving fuse terminal blades 30 (shown in Figure 9). Electrically conductive resilient clips 58 are located below each fuse terminal opening 54 and located in cavities 60 below fuse receptacle 316. Bridge portions 62 extend downwardly from each clip 58 and to electrically conductive bullet contact assemblies 16 for line-side electrical connection, and also to electrically conductive terminal stud contact assemblies 102 for load-side electrical connections. When fuse terminals 30 (shown in Figure 9) are inserted through fuse terminal openings 54, fuse terminals 30 are received in clips 58 and thus are electrically coupled to bullet contact assemblies 16 and to terminal stud contact assemblies 102 protruding through a bottom 64 of housings 310 and 312.

[0059] Switch housing internal alarm terminal 66 is positioned adjacent one of fuse clips 58 within an adjacent cavity 68 in housing 310, and includes a projecting ridge 70 (shown in Figure 3) at a top end 72 (also shown in Figure 3) that protrudes through an opening 74 (as shown in Figure 3) in a side wall 76 (see Figure 3) of fuse receptacle 310. Thus, when fuse 202 (shown in Figure 10) is fully inserted into fuse receptacle 306 (shown in Figure 10) that is jointly formed by receptacles 316 of each housing 310, 312, alarm terminal projecting ridge 70 contacts fuse alarm terminal 42 (shown in Figure 9) through an opening in fuse housing 32 (similar to opening 44 shown in Figure 2). Internal alarm terminal 66 is further coupled to a remote output alarm terminal (not shown in Figure 11 but similar to terminal 78 shown in Figure 5) that extends through a bottom 64 of switch housings 310 and 312, thereby completing an electrical path for an open fuse alarm signal for transmission to end use equipment (not shown) during an open fuse condition.

[0060] Mounting footings 228 are provided in each housing 310, 312 adjacent fuse receptacles 316, and known fasteners 230 are extended through openings in housings 310, 312 and spacer element 314 to secure assembly 302 in an assembled condition as shown in Figure 10.

[0061] Output bus 304 is coupled to terminal stud contact assemblies 102 with known fasteners 320 and includes terminal stud connectors 322 extending from a top surface 324 of bus element 304.

[0062] Fuse 202 in combination with switch housing assembly 302 provides a fused disconnect switch assembly 300 (shown in Figure 10) that facilitates installation to existing equipment without auxiliary components or hand wired

connections and is capable of higher current protection than a system utilizing switch housing assembly 100 (shown in Figure 5). Switching is achieved by inserting or extracting fuse 202 from switch housing fuse receptacle 306 (shown in Figure 10), and local and remote opened fuse indication provides ready indication of opened fuses for replacement. Because a variety of differently rated fuses are accommodated by switch housing receptacle 306, a versatile fused disconnect system 300 is provided that is suitable for a wide variety of applications.

[0063] It is recognized that system 300 could be further extended to obtain even greater amperage ratings, e.g., a triple-wide fuse and switch housing assembly could be employed.

[0064] Figure 12 is an exploded view of a yet another embodiment of a switch housing assembly 350 similar to switch housing assembly 302 (shown in Figure 11). Switch housing assembly 350 is substantially similar to switch housing assembly 302 with the exception of terminal stud contact assemblies 102 are employed to form both line-side and load-side electrical connectors. In other words, bullet contact assemblies 16 shown in Figure 11 are replaced with terminal stud contact assemblies 102. For ease of reference, common features of assembly 350 and assembly 302 are indicated with like reference characters.

[0065] Figure 13 schematically illustrates an alarm circuit 360 for a fuse 362, such as fuse 12 (shown in Figures 1 and 2) or fuse 202 (shown in Figures 7, 9 and 10). Fuse terminals 30 (shown in Figures 1, 2, 7 and 10) are connected to line and load circuitry of the end use application at points 364 and 366 through applicable terminal contact portions of a switch housing assembly, such as those described above. An electrical circuit is therefore established through fuse link(s) 34 (shown in Figures 2 and 9) and through an electronic monitoring circuit 368 formed on printed circuit board 262 (shown in Figure 9) of open fuse indication device 36 (also shown in Figure 9). Electronic monitoring circuit 368 has a sufficiently high resistance so that in normal operation of fuse 362 substantially all of the current flowing through the fuse passes through fuse link 34.

[0066] When fuse link 34 opens in a current overload or short circuit condition, electronic monitoring circuit 368 detects a voltage drop across terminals 30 and illuminates LED 38, as well as outputs an alarm signal through alarm terminal 42 (both shown in Figures 2 and 9) to a remote output alarm terminal 66 of a switch housing assembly, such as those described above. Alarm terminal output 66 is

coupled to end-user circuitry 370 that in an illustrative embodiment, includes a relay 372 that may be used to identify a location of an operated or opened fuse 362 in a system employing a large number of fuses in various locations. In one embodiment, a load side of LED 38 is connected to output alarm terminal 66, thereby supplying 20 mA current to relay 372 for remote fuse state indication. Thus, as LED 38 is energized, a remote alarm signal is also sent through output alarm terminal 66.

[0067] Figure 14 illustrates an exemplary electronic monitoring circuit 380 for alarm circuit 368 (shown in Figure 13). Terminal J1 is coupled to the line or input side of the fuse, and more specifically, to fuse terminal posts 258 (shown in Figure 9) that is associated with-line side circuitry of the fuse application. Terminal J2 is coupled to the load or output side of the fuse, and more specifically, to fuse terminal post 258 (shown in Figure 9) that is associated with load side circuitry of the fuse application. Terminal J3 is electrically connected through an appropriate impedance to the return or common electrical ground of the fused circuit. A pair of matched transistors, namely an NPN transistor Q1 and a PNP transistor Q2 are employed with diodes D3, D4 to prevent current leakage (about 1.2. mA in one embodiment) through respective transistors Q1, Q2. Therefore, diodes D3, D4 prevent false fuse state indication resulting from low base emitter voltage of transistors Q1 and Q2, and further provide transient immunity for electronic monitoring circuit 368 arc-voltage during operation of the fuse. A bipolar LED 38 (indicated by D5 in Figure 14 and also shown in Figure 9) is coupled to transistors Q1, Q2 and terminal J3.

[0068] In normal operation, electronic monitoring circuit 368 is a passive component, i.e., active components of electronic monitoring circuit are non-conducting and voltage drop across terminals J1 and J2 is negligible. Consequently, LED 38 is not illuminated and stress on the circuit components is primarily thermal. However, after an overload or short-circuit condition in the fused circuit causes fuse 202, or more specifically fuse links 34 to operate, the resultant voltage drop across terminals J1 and J2 causes either transistor Q1 or Q2, depending upon system voltage polarity, to saturate and actively conduct to energize LED 38.

[0069] More specifically, in case of positive system voltage, full system voltage is impressed across terminals J1 and J2 when fuse links 34 have opened, thereby forward biasing a base-emitter junction of PNP transistor Q2 through resistor R1. In this condition, as the base-emitter junction voltage is greater than an